




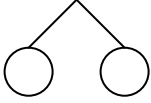



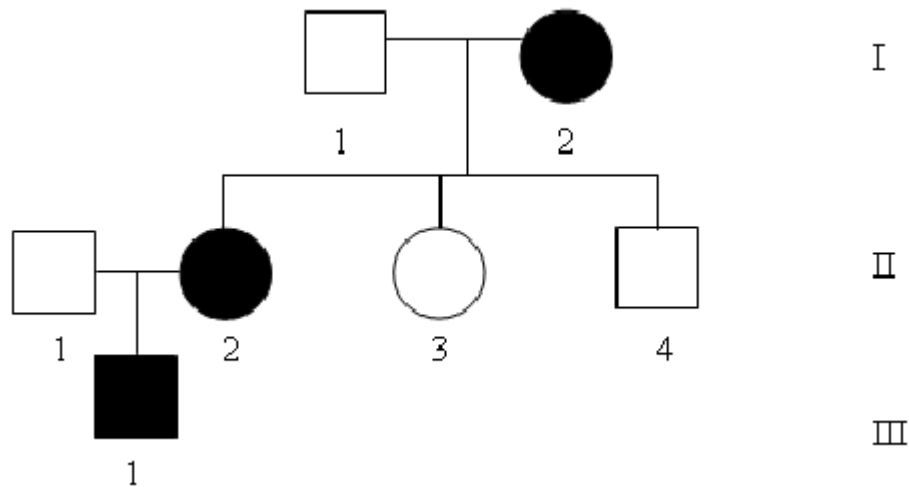
# Building a Pedigree

A pedigree is a diagram that shows how organisms are related and also traces the occurrence of a particular trait or characteristic for several generations. The genetic makeup of individuals in the pedigree might be determined if one understands the laws of heredity and probability.

Observe the symbols and the example of the pedigree below:

Male without trait		Male with trait	
Female without trait		Female with trait	
Male, Died in infancy		Identical twins	
Female, Died in infancy			

Pedigree showing blue-eyed trait:



Generation I represents the parents

Generation II represents the parent's children and a son-in-law

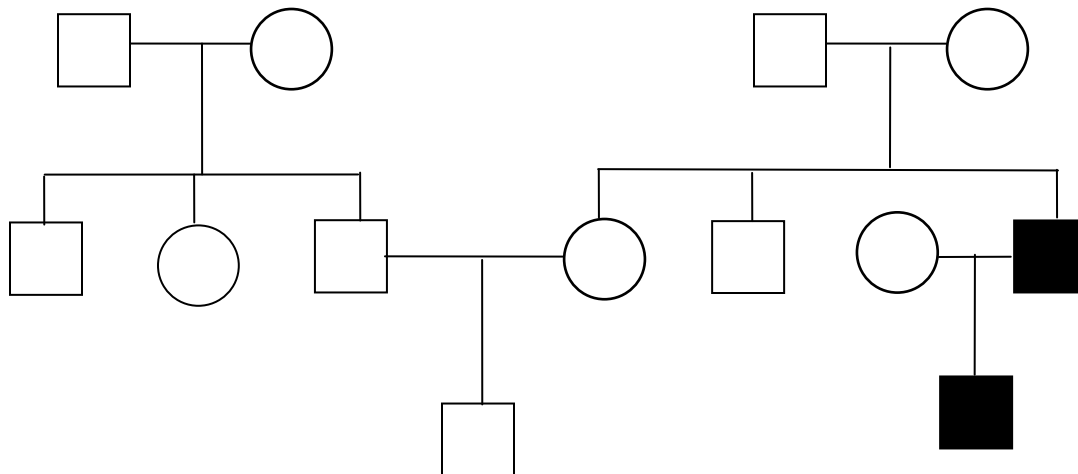
Generation III represents the male grandchild

Colored-in symbols have the genotype  $bb$

Non colored-in symbols have at least one  $B$  allele

The second allele of the brown-eyed people in the pedigree might be able to be determined from their parents of children

**Pedigree 2:** Hemophilia is a sex-linked genetic disease caused by recessive allele ( $X^h$ ) which doesn't allow the blood to clot. Female hemophiliacs are homozygous recessive, but carrier females have only one allele and their blood clots normally. List the genotypes of each individual in the pedigree below.



Female with Hemophilia



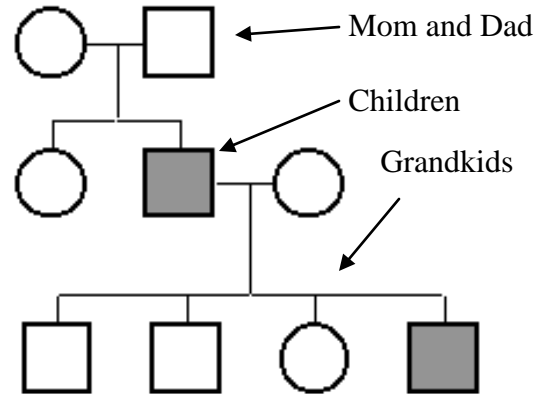
Female with normal Blood Clotting

If individual 2 in generation III were to marry a woman that was normal for blood clotting,  $X^H X^H$  what is the chance that their first child will be a hemophiliac?

Name: \_\_\_\_\_

## PEDIGREE'S AND HARRY POTTER

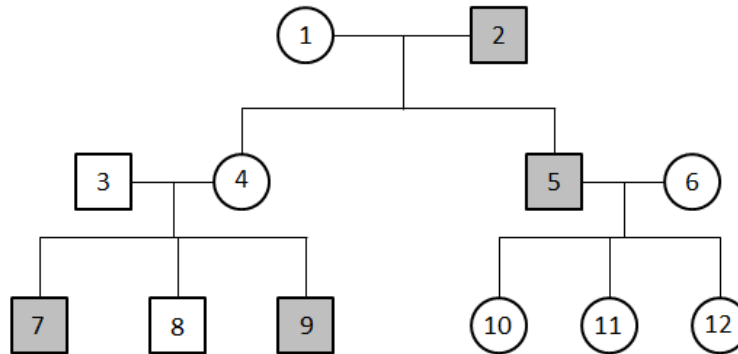
A pedigree is a diagram of family relationships that uses symbols to represent people and lines to represent genetic relationships. These diagrams make it easier to visualize relationships within families, particularly large extended families. A sample pedigree is to the right:



In a pedigree, **squares represent males** and **circles represent females**. Horizontal lines connecting a male and female represent mating. Vertical lines extending downward from a couple represent their children. New generations are, therefore, written underneath the parental generations and the oldest individuals are found at the top of the pedigree.

If the purpose of a pedigree is to analyze the pattern of inheritance of a particular trait, it is customary to **shade in the symbol of all individuals that show this trait**. Other times, you will see the genotypes of the individuals written inside the circles or squares. If the genotype is unknown or partially unknown, a question mark is used in the pedigree.

Here is a sample pedigree showing 3 generations.



What are the relationships between...?

1 and 5 Mother (1) and Son (5)

1 and 2 \_\_\_\_\_

1 and 10 \_\_\_\_\_

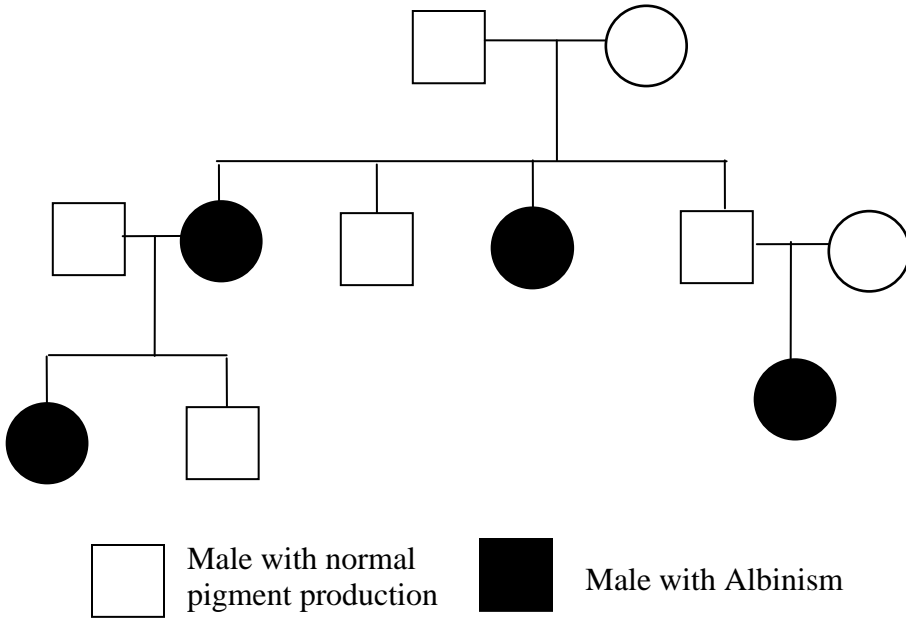
4 and 5 \_\_\_\_\_

3 and 5 \_\_\_\_\_

5 and 8 \_\_\_\_\_

- How many grandkids do 1 & 2 have? \_\_\_\_\_
- The pedigree above shows the recessive genetic disorder of colorblindness. Which of the individuals in the family are colorblind?
- In the family pedigree the majority of individuals that are colorblind are which gender? This is a good indicator that colorblindness is what?

**Pedigree 1:** An individual with albinism lacks an enzyme needed to form the skin pigment melanin. This condition is controlled by a recessive allele. Use DD to represent the allele for normal skin and dd to represent the genotype for albinism. Fill in the genotypes below each individual in the pedigree below.



If individuals 1 & 2 in generation II were to have another child, what is the chance the next child will be normal?

*Now that you have had a chance to familiarize yourself with a pedigree chart, you will now apply what you have learned about genetics in the construction of pedigrees for the characters in the “Harry Potter” series.*

## Muggle or *Magic*: A Human Pedigree Activity

Assume that non-magical ability is dominant (M) and magical ability is recessive (m). This would explain why we’re not all witches and wizards (unfortunately). A person without any magical abilities is also known as a muggle. Use the key below to answer the questions.



1. If Mr. and Mrs. Weasley are a wizard and a witch, what are their genotypes?

Mr. Weasley \_\_\_\_\_ Mrs. Weasley \_\_\_\_\_

2. What must be the genotype of Mr. and Mrs. Weasley’s children? (Bill, Charlie, Percy, Fred, George, Ron, and Ginny)?

3. Draw a pedigree for the Weasley family below. Use shading to indicate genotype. Also, write the names and genotypes below each of the circles or squares.

4. Now let’s look at Hermione Granger’s family. Hermione is a witch but her parents are both muggles. What are the genotypes for the three members of the Granger family?

Mom \_\_\_\_\_ Dad \_\_\_\_\_ Hermione \_\_\_\_\_

5. Based on the above information, is Malfoy correct in calling Hermione a Mudblood? (that term would imply that she is mixed or **heterozygous** for magical ability)

6. Draw a pedigree for the Granger family below. Use shading to indicate genotype. Also, write the names and genotypes below each of the circles or squares.

6. Finally, draw a family pedigree of three generations of Harry Potter's family. Below is some information about Harry's family history. Piece it together to make a pedigree.

Harry is a wizard. His father, James, was a wizard and his mother, Lily, was a witch. Both of James' parents had magical abilities; however, Lily's parents did not nor does Lily's sister Petunia. Petunia is married to Vernon Dursley and they have a son, Dudley. None of the Dursleys have magical powers. Use shading to indicate genotype. Also, write the names and genotypes below each of the circles or squares. For those who only one allele is known, write the known allele and a question mark.

7. Harry Potter married Ginny Weasley and had three children, two boys and girl. Add Ginny and their children onto the pedigree for Harry's family and be sure to indicate if they would be magical or not. **Bonus Points** if you know the children's names.